WHAT IS CLAIMED IS:

1. A fuel cell system, comprising:

(a) a fuel cell comprising an anode input for a hydrogen-containing anode supply stream, a cathode input for an oxidant-containing cathode supply stream, an anode effluent output, and a cathode output for cathode effluent comprising water produced by said fuel cell;

(b) a water transfer device, comprising (i) a device cathode effluent input connected to said cathode output, (ii) a device supply stream output connected to either or both of said fuel cell inputs, and (iii) a water-transfer membrane;

wherein said water transfer device transfers water from said cathode effluent to either or both of said supply streams, and wherein the temperature of said cathode effluent at said device cathode effluent input is not significantly greater than the temperature of said cathode effluent at said cathode output; and said temperature at said device input being sufficient to maintain water in its vapor state and being greater than its dew point and up to about 10 ºC above its dew point.

2. A fuel cell system according to Claim 1, wherein said water transfer membrane comprises poly acid.

3. A fuel cell system according to Claim 1, wherein said anode supply stream comprises reformate from a hydrocarbon fuel processor.

4. A fuel cell system according to Claim 3, wherein said hydrocarbon fuel processor comprises an autothermal reformer.

5. A fuel cell system according to Claim 1, wherein said water transfer device transfers water to said cathode supply stream.

6. A fuel cell system, comprising:

(a) a fuel cell comprising an anode input for a hydrogen-containing anode supply stream, a cathode input for an air supply stream, an anode output for anode effluent comprising water produced by said fuel cell; and a cathode output for cathode effluent comprising water produced by said fuel cell;

(b) a compressor having an input for an air stream and an output connected to said cathode input of the fuel cell stack; and

(c) a water transfer device, comprising (i) a device effluent input connected to one or both of the outputs of said fuel cell, (ii) a device supply stream output connected to the input of said compressor, and (iii) a water-transfer membrane;

wherein said water transfer device transfers water from one or both of said anode effluent and said cathode effluent outputs to said air stream input to the compressor; and

wherein said cathode effluent has a temperature at said device input, said temperature being sufficient to maintain water in its vapor state and being greater than its dew point and up to about 10 ºC above its dew point.

7. A fuel cell system according to Claim 6, wherein said water transfer membrane comprises poly[perfluorosulfonic] acid.

8. A fuel cell system according to Claim 6, wherein said anode supply stream comprises reformate produced by a hydrocarbon fuel processor.

9. A fuel cell system according to Claim 8, wherein said hydrocarbon fuel processor comprises an autothermal reformer.

10. A method of operating a fuel cell power plant comprising a reactor for the production of a reformate supply stream using a reactant stream comprising a reactor oxidant stream and a reactor hydrocarbon fuel stream, wherein said reformate supply stream comprises water; and a fuel cell comprising an anode input for said reformate supply stream, a cathode input for a cathode oxidant supply stream, an anode output for an anode effluent stream, a cathode output for an cathode effluent stream, wherein either or both of said anode effluent and said cathode effluent comprise water produced by said fuel cell; said method comprising:

(a) transferring water from said reformate supply stream to a one or both of said reactant streams in a first water transfer device that has a high pressure side and a low pressure side, by transporting said one or both of said reactant streams through said low pressure side, and by transporting said reformate supply stream through said high pressure side; and

(b) transferring water from one or more of said reaction oxidant stream said reformate supply stream, and said cathode oxidant supply stream in a second

water transfer device that has a high pressure side and a low pressure side, by transporting said one or more of said reactor oxidant stream, said reformate supply stream, and said cathode oxidant supply stream though said low pressure side, and by transporting one or both of said effluent streams through said high pressure side.

11. The method of Claim 10, wherein each of said water transfer devices comprises a membrane which comprises poly[perfluorosulfonic] acid.

12. The method of Claim 10, wherein said second water transfer device transfers water from said cathode effluent to said air supply stream.

13. The method of Claim 10, wherein said second water transfer device is connected to said reactor through said first water transfer device, and transfers water to a reactant stream of said reactor.

14. The method of Claim 13, wherein said reactant stream is said reactor oxidant stream comprising air.

15. The method of Claim 14, wherein said air is at a temperature less than about 50°C.

16. The method of Claim 15, wherein said air is at about ambient temperature.

17. The method of Claim 10, wherein said reactor comprises an autothermal reactor.

18. The method of Claim 17, wherein said reactor additionally comprises a water-gas shift reactor and a preferential oxidation reactor, and wherein said autothermal

reactor produces reformate which is supplied, in series, to said water-gas shift reactor and to said preferential oxidation reactor, and wherein said first water transfer device transfers water from said reformate stream after said reformate exits said water-gas shift reactor and before said reformate enters said preferential oxidation reactor.

19. The method of Claim 17, wherein said reactor additionally comprises a water-gas shift reactor and a preferential oxidation reactor, and wherein said autothermal reactor produces reformate which is supplied, in series, to said water-gas shift reactor and to said preferential oxidation reactor, and wherein said first water transfer device transfers water from said reformate stream after said reformate exits said preferential oxidation reactor.

20. The method of Claim 10, additionally comprising an air moving device connected to said cathode input, wherein said air supply stream flows through said air moving device before entering said cathode input, and wherein said second water transfer device is connected to the input of said compressor and transfers water to said air supply stream prior to the entry of said stream into said air moving device.